

## BLEACH AND VINEGAR DETERGENT SYSTEM

### Background of the Invention

In public restaurants, cleanliness is considered a pillar of restaurant maintenance. Reasons include stopping the spread of bacteria that can lead to foodborne diseases. According to the Partnership for Food Safety Education, necessary areas and objects of focus for cleanliness include cutting boards, knives, utensils, countertops, stainless steel counters, walls, windows, appliances, ovens, stove tops, burners, pots, pans, stove hoods, and vents. The various necessary areas and objects of focus for cleanliness listed previously are many times subject to "oily soil" stains. Oily soil refers to petroleum products, such as vegetable oil, that can be the cause of stains in restaurants.

Current methods and means for addressing oily soils include liquid aqueous synthetic organic detergent compositions that can be used for hand washing of dishes and hard surfaces. The liquid detergent compositions usually comprise anionic, cationic and/or nonionic surfactants, builders and adjuvants. The liquid detergent compositions can serve to emulsify the oily soils in aqueous media. Liquid detergent compositions can also contain enzymes which are useful for hydrolysis of triglycerides, proteins, and starch.



In the art, it is taught that oily soil is removed by the combined action of surfactants and enzymes. Builders usually include zeolite and phosphate.

The removal of oily soil from necessary objects and areas in a restaurant more than likely occurs via three mechanisms: (1) roll-up, (2) emulsification, or  
5 (3) solubilization. In Roll-up mechanism, the oily soil is reduced when the contact angle is larger than  $90^\circ$ . In Emulsification mechanism, a low-interfacial tension between the oily soil and detergent solution is required. In Solubilization mechanism, the oily soil is solubilized into an *in situ* formed microemulsion. It is generally held that Roll-up, being related to wetting  
10 agents, is relatively simple to achieve, and Emulsification and Solubilization require fine tuning of the composition.

Detersive systems have also been employed in the cleaning of necessary objects and areas in restaurants. Detersive systems are concentrates comprising mixtures of cleaning ingredients that, when mixed with water, form  
15 a cleaning medium or use compositions. Detersive systems can be in the form of a liquid, a particulate, or a solid.

The Encyclopedia of Chemical Technology discussing the use of single and combination ingredient detersive systems and their suitable uses, for example for glass and ceramics by hand (hand dishwashing) that may control



oily soil and solid organic material, an organic surfactant is suitable with a mechanical action of moderate to vigorous; for cleaning metal structures and equipment, tanks, etc. that contains mostly oily soil and some organic solid material, and inorganic surfactant worked by suitable with a mechanical action  
5 of vigorous rubbing, sometimes hydraulic.

The prior art teaches inventions that show the use of deterative systems for cleaning. U.S. Patent No. 4,793,942 to Lokkesmoe et al. teaches the use of a deterative agent containing a soil removing detergent and a softening agent having an inner acidic aqueous phase and an exterior organic complexing  
10 agent phase. U.S. Patent No. 5,643,861 to de Guertechin et al. teaches a cleaning composition containing a bleachant system incorporated in three liquid phases, wherein each phase essentially contains a polar solvent, a non-polar solvent, or a weakly polar solvent and an amphiphile.

The use of bleaching agents in cleaning composition is well-known in the  
15 art. In warewashing, the primary role of bleach is to reduce spotting and filming by breaking down and removing the last traces of absorbed soils. U.S. Patent No. 4,793,942 teaches the incorporation of sources of active chlorine, including sodium hypochlorite, calcium hypochlorite, and chlorinated sodium tripolyphosphate. U.S. Patent No. 5,643,861 discusses the inclusion of a



peroxygen bleach. U.S. Patent No. 4,164,477 to Whitley teaches a detergent containing cleaning additives, and the option to include a bleach such as calcium hypochlorite, sodium hypochlorite or hydrogen peroxide.

Vinegar is the liquid condiment or food flavoring used to give a sharp or  
5   sour taste to foods. It is also used as a preservative. Vinegar consists principally of water, acetic acid, mineral salts, and the organic constituents of the natural organic starting material.

The percentage of acetic acid in vinegar usually consists of 3 to 5%.

Regarding cleaning compositions, acetic acid and vinegar have been  
10   incorporated in some instances. U.S. Patent No. 4,164,477 teaches the incorporation of vinegar into a mold or mildew remover concentrate. U.S. Patent No. 4,793,942 teaches the incorporation of an acid such as acetic acid into the composition. U.S. Patent No. 5,436,008 teaches the incorporation of acidulants such as acetic acid.

15       Regarding the use of bleach with acetic acid or vinegar, it is well-known in the art of cleaning that bleach and acetic acid or vinegar should not be mixed. The mixture of bleach with vinegar has, prior to this invention, resulted in the release of highly toxic chloramine gas. It is known that short-term exposure to this gas can result in mild asthmatic symptoms, or serious respiratory



problems.

The instant invention relates to a deterative system that, in addition to containing various cleaning ingredients, contains a bleach and vinegar that creates a synergistic affect useful in the cleaning of necessary areas and objects of focus for cleanliness in restaurants. Additionally, the deterative system of the instant invention can be used in the cleaning of many different surfaces including stainless steel, Formica<sup>TM</sup>, chrome, glass, plastic, and carpet. The deterative system of the instant invention is also effective against oily soil stains. The invention also relates to a method of making such a deterative system containing a bleach and vinegar, while avoiding the release of toxic amounts of harmful chloramine gas.

### **Summary of the Invention**

This invention relates to a deterative system containing a surfactant, bleach, vinegar, water, and alternatively, emollients, foaming agents, perfumes, and builders, for the cleaning of necessary areas and objects of focus for cleanliness.

Accordingly, it is one object of the present invention to provide a deterative system that is created by a synergistic activity between the bleach and vinegar, such that cleaning properties of the deterative system is improved.



It is another object of the present invention to provide a deterative system containing a bleach and vinegar while avoiding the release of a toxic amount of gas.

It is still further another object of this invention to provide a deterative system that is useful on cleaning oily soils that may be present in restaurant and non-restaurant areas.

Other objects of this invention will become apparent from time to time throughout the specification and claims as related herewith.

### **Description of the Invention**

Deterative systems are concentrates comprising mixtures of cleaning ingredients that when mixed with water form a cleaning medium. The deterative system suitable for the instant invention can include, but is not limited to, surfactants, a bleach, vinegar agents, builders, enzymes, foaming agents, emollients, antiredeposition agents, solvents, hydrotropes, fluorescers, foam boosters, foam controllers, sodium carbonate, sodium bicarbonate, sodium silicate, sodium sulphate, calcium chloride, and perfumes. In a preferred embodiment, the deterative system consists of surfactants, a bleach, vinegar, emollients, builders, and foaming agents. The deterative system can be in solid, particulate, or liquid form concentrate, most preferably in liquid form



concentrate.

### **Surfactants**

- Nonionic, anionic and/or cationic surfactants may be used in the instant composition, individually, or two or more in combination. Examples of
- 5 such include sodium or potassium salts of fatty acids, rosin acids, and fall oil; alkylenesulfonates such as propylene tetramerbenzene sulfonate; alkyl sulfates or sulfonates including both branched and straight-chain hydrophobes as well as primary and secondary sulfate groups; sulfates and sulfonates containing an internal linkage between the hydrophobic and hydrophilic groups
- 10 such as taurides and sulfonated fatty mono-glycerides, long chain acid esters of polyethylene glycol; polyalkylene glycol esters of alkyl phenols wherein the alkylene group is derived from ethylene or propylene oxide or mixtures thereof; polyalkylene glycol esters of long chain alcohols or mercaptans, fatty acid diethanolamides; block copolymers of ethylene oxide and propylene oxide.
- 15 Nonionic surfactants include C5-12 alkyl phenol ethoxylates and/or propylates, EO/PO block copolymers, or mixtures thereof. Specific examples of surfactants include sodium octyl sulfate, sodium 2-ethyl hexyl sulfate, sodium dodecyl sulfate, sodium decyl sulfate, sodium lauryl sulfate, sodium laureth sulfate, disodium lauryl sulfosuccinate, disodium laureth sulfosuccinate, ammonium



lauryl sulfate, ammonium laureth sulfate, triethanolamine lauryl sulfate,  
 triethanolamine laureth sulfite, monoethanolamine lauryl sulfite,  
 monoethanolamine laureth sulfate, potassium lauryl sulfate, potassium laureth  
 sulfate, magnesium lauryl sulfate, magnesium laureth sulfate, sodium nonyl  
 5 phenol ether sulfate, sodium alpha-olefin sulfonate, ethylene glycol  
 monostearate, and ethylene glycol distearate.

Suitable surfactants also include commercially available detergents.

Commercially available detergents refer to detergents that are manufactured  
 and available on the marketplace. For the instant invention, a commercially  
 10 available detergent generally comprises an anionic, cationic, and/or nonionic  
 surfactants, builders, emollients, water, and foaming agents. An example of a  
 suitable commercially available detergent is Silky Pink™ hand dishwash  
 detergent, available from Carroll Company, Garland Texas. The ingredients  
 of Silky Pink™ include sodium lauryl sulfate (surfactant), water,  
 15 dodecylbenzene sulfonic acid (sodium salt) (builder), urea (emollient),  
 cocoamide DEA (foaming agent)

Surfactants can be used in an amount of from about 50 to about 80 weight  
 percent, more preferably from about 60 to about 75 weight percent, and most  
 preferably from 70 to about 73 weight percent.



**BI ach**

Bleaching compounds are suitable for use in cleaning hard surfaces as well as dishware. The primary role of bleach in dishware washing is to reduce the spotting and filming by breaking down and removing the last traces of absorbed soils. In the instant invention, suitable bleaching compounds include chlorine, sodium hypochlorite, calcium hypochlorite, bleach liquor, lime bleach liquor, bleaching powder, chlorinated lime, chloride of lime, dibasic magnesium hypochlorite, lithium hypochlorite, chlorinated trisodium phosphate, hypochlorous acid, oxidized chlorides, hypobomites, chlorinated isocyanurates, halogenated hydantoin, sodium N-chlorobenzenesulfonamide, sodium N-chloro-p-toluenesulfonamide, N-chlorosuccinimide, trichloromelamine, 1,3-dichlorotetrahydroquinazoline-2,4-dione, tetrachloroglycoluril, sodium trichlorometaphosphimate, sodium N-chloroimido-disulfonate, and N-chlorophenylbiquanidino, chlorine dioxide, hydrogen peroxide, sodium perborate, sodium tetrahydrate, sodium monohydrate, sodium carbonate peroxyhydrate, peroxymonosulfuric acid (Caro's Acid), and potassium permonosulfate. In a preferred embodiment, sodium percarbonate is used as the bleach compound in the deterative system of the instant invention. The bleach compound in the system can be used in an amount of from about 0.010



to about 6 weight percent, more preferably from about 0.020 to about 4 weight percent, and most preferably from about 0.022 to about 2 weight percent.

Bleach compounds may be used individually, or two or more in combination.

### **Vinegar**

5       Vinegar is considered a sharp or sour wine that consists primarily of water, acetic acid, mineral salts, and organic constituents. Vinegar results from the action of the enzymes of bacteria of the genus *Acetobacter*, and from the dilute solutions of ethyl alcohol. Primary sources of vinegar include fruits, honey, barley malt, and rice. In the instant invention, suitable vinegar may be derived  
10   from the sources of jujube, sweet potato, dates, citrus, persimmon, pear, sugar cane, plum, tomato, kiwi fruit, pineapple, molasses honey, palm sap, muscavado, potato, soybean, seaweed, rice, grain, starch, onions, bamboo grass, wood, whey, coconut water, and vinasse. Commercially available types of vinegar that are suitable for the deterative system of the invention  
15   include cider vinegar, apple vinegar, white vinegar, malt vinegar, sugar vinegar, glucose vinegar, or spirit vinegar. Vinegars may be used individually, or two or more in combination. More preferably, the deterative system contains white vinegar, cider vinegar, and/or apple vinegar. Most preferably, the deterative system contains white vinegar. The vinegars can be used in an amount of



from about 10 to about 20 weight percent, more preferably from about 15 to about 18 weight percent, and most preferably from about 16 to about 17 weight percent.

### **Emollients**

- 5        Emollients may be included in the deterative system of the instant invention to provide a "softening feeling" to the skin of users of the instant invention.
- Suitable emollients can include, for example, urea, mineral oil, petrolatum, and isocetyl stearyl stearate. Emollients can be used individually or in combination.

### **10    Foaming Agents**

- Foaming agents can be contained in the deterative system of the invention.
- Suitable agents include cocoamide diethanolamide (DEA), cocoamide monoethanolamide (MEA), cocoamide triethanolamide (TEA), lauramide DEA, lauramide MEA, lauramide TEA, polysorbate 20, polysorbate 60, polysorbate
- 15    80, ammonium or alkaline salts of sulphated aliphatic alcohols, ammonium or alkaline salts of sulfated aliphatic ethoxylated alcohols, cocoamide derivatives, lauramide derivatives, and/or ethoxylate aliphatic phenolics. Foaming agents can be used individually, or two or more in combination.



## Perfumes

- Suitable perfumes that can be contained in the deterative system include,
- acetyl cedrene; 4-acetoxy-3-pentyltetrahydropyran;
- 4-acetyl-6-t-butyl-1,1-dimethylindane, available under the trademark
- 5 "CELESTOLIDE"; 5-acetyl-1,1,2,3,3,6-hexamethylindane, available under the trademark "PHANTOLIDE"; 6-acetyl-1-isopropyl-2,3,3,5-tetramethylindane, available under the trademark "TRASEOLIDE"; alpha-n-amylcinnamic aldehyde; amyl salicylate; aubepine; aubepine nitrile; aurantion;
- 2-t-butylcyclohexyl acetate; 2-t-butylcyclohexanol; 3-(p-t-butylphenyl)propanal;
- 10 4-t-butylcyclohexyl acetate; 4-t-butyl-3,5-dinitro-2,6-dimethyl acetophenone; 4-t-butylcyclohexanol; benzoin siam resinoids; benzyl benzoate; benzyl acetate; benzyl propionate; benzyl salicylate; benzyl isoamyl ether; benzyl alcohol; bergamot oil; bornyl acetate; butyl salicylate; carvacrol; cedar atlas oil; cedryl methyl ether; cedryl acetate; cinnamic alcohol; cinnamyl propionate;
- 15 cis-3-hexenol; cis-3-hexenyl salicylate; citronella oil; citronellol; citronellonitrile; citronellyl acetate; citronellyloxyacetaldehyde; cloveleaf oil; coumarin;
- 9-decen-1-ol; n-decanal; n-dodecanal; decanol; decyl acetate; diethyl phthalate; dihydromyrcanol; dihydromyrcenyl formate; dihydromyrcenyl acetate; dihydroterpinyl acetate; dimethylbenzyl carbinyl acetate;



- dimethylbenzylcarbinol; dimethylheptanol; dimyrcatol; diphenyl oxide; ethyl naphthyl ether; ethyl vanillin; ethylene brassylate; eugenol; geraniol; geranium oil; geranonitrile; geranyl nitrile; geranyl acetate;
- 1,1,2,4,4,7-hexamethyl-6-acetyl-1,2,3,4-tetrahydronaphthalene, available
- 5 under the trademark "TONALID";
- 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-2-benzopyran, available under the trademark "GALAXOLIDE"; 2-n-heptylcyclopentanone;
- 3a,4,5,6,7,7a-hexahydro-4,7-methano-1(3)H-inden-6-ylpropionate, available under the trademark "FLOROCYCLENE";
- 10 3a,4,5,6,7,7a-hexahydro-4,7-methano-1(3)H-inden-6-ylacetate, available under the trademark "JASMACYCLENE";
- 4-(4'-hydroxy-4'-methylpentyl)-3-cyclohexenecarbaldehyde;
- alpha-hexylcinnamic aldehyde; heliotropin; Herculyn D; hexyl aldol; hexyl cinnamic aldehyde; hexyl salicylate; hydroxycitronellal; i-nonyl formate;
- 15 3-isocamphylcyclohexanol; 4-isopropylcyclohexanol; 4-isopropylcyclohexyl methanol; indole; ionones; irones; isoamyl salicylate; isoborneol; isobornyl acetate; isobutyl salicylate; isobutylbenzoate; isobutylphenyl acetate;
- isoeugenol; isolongifolanone; isomethyl ionones; isononanol; isononyl acetate; isopulegol; lavandin oil; lemongrass oil; linalool; linalyl acetate; LRG 201;



- 1-menthol; 2-methyl-3-(p-isopropylphenyl)propanal;
- 2-methyl-3-(p-t-butylphenyl)propanal; 3-methyl-2-pentyl-cyclopentanone;
- 3-methyl-5-phenyl-pentanol; alpha and beta methyl naphthyl ketones; methyl  
ionones; methyl dihydrojasmonate; methyl naphthyl ether; methyl 4-propyl
- 5 phenyl ether; Mousse de chene Yugo; Musk ambrette; myrtenol; naroli oil;
- nonanediol-1,3-diacetate; nonanol; nonanolide-1,4, nopol acetate;
- 1,2,3,4,5,6,7,8-octahydro-2,3,8,8-tetramethyl-2-acetyl-naphthalene, available  
under the trademark "ISO-E-SUPER"; octanol; Oppoponax resinoid; orange oil;
- p-t-amylcyclohexanone; p-t-butylmethylhydrocinnamic aldehyde;
- 10 2-phenylethanol; 2-phenylethyl acetate; 2-phenylpropanol; 3-phenylpropanol;
- para-menthan-7-ol; para-t-butylphenyl methyl ether; patchouli oil; pelargene;
- petitgrain oil; phenoxyethyl isobutyrate; phenylacetaldehyde diethyl acetal;
- phenylacetaldehyde dimethyl acetal; phenylethyl n-butyl ether; phenylethyl  
isoamyl ether; phenylethylphenyl acetate; pimento leaf oil; rose-d-oxide;
- 15 Sandalone; styrallyl acetate)
- 1,1,4,4-tetramethyl-6-acetyl-7-ethyl-1,2,3,4-tetrahydronaphthalene, available  
under the trademark "VERSALIDE"; 3,3,5-trimethyl hexyl acetate;
- 3,5,5-trimethylcyclohexanol; terpeneol; terpinyl acetate; tetrahydrogeraniol;
- tetrahydrolinalool; tetrahydromugulol; tetrahydromyrcenol; thyme oil;



trichloromethylphenylcarbinyl acetate; tricyclodecanyl acetate; tricyclodecanyl propionate; 10-undecen-1-al; gamma undecalactone; 10-undecen-1-ol undecanol; vanillin; vetiverol; vetiveryl acetate; vetyvert oil; acetate and propionate esters of alcohols in the list above; aromatic nitromusk fragrances; indane musk fragrances; isochroman musk fragrances; macrocyclic ketones; 5 macrolactone musk fragrances; and tetralin musk fragrances. The perfumes can be used individually, or in combination in the deterative system.

### **Builders**

Builders function as sequestering agents for divalent ions, thus preventing 10 surfactant precipitation as Ca or Mg salts in areas of hard water. Suitable builders in the deterative system of the instant invention can include, but are not limited to, crystalline aluminosilicate, such as alkali metal aluminometasilicate and/or sodium aluminosilicate (zeolite), phosphate builders such as sodium tripolyphosphate, sodium orthophosphate or sodium pyrophosphate, inorganic 15 builders such as sodium carbonate, layered silicate or amorphous aluminosilicate, organic builders such as polycarboxylate polymers including polyacrylates, acrylic/maleic copolymers, polyaspartates, monomeric polycarboxylates, citrates, gluconates, oxydisuccinates, glycerol mono-, di- or tri-succinates, carboxymethyloxysuccinates, carboxymethyloxymalaontes,



dipicolinates, hydroxyethyliminodiacetates, alkyl-, alkenylmalonates, succinates, and sulphonated fatty acid salts. The builders may be used individually, or two or more in combination in the instant invention. Builders may be used in an amount of from about 0 to about

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## EXAMPLES

I.

<u>Ingredients</u>	<u>Weight Percent</u>
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Sodium Percarbonate (bleach)	0.022%
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10 White Vinegar	16.33%
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Silky Pink™ detergent	72.63%
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Water	balance
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In making the formulation, white vinegar is first added to the Silky Pink™ detergent, followed by the addition of sodium percarbonate. Water is then

15 added.

II.

<u>Ingredients</u>	<u>Weight Percent</u>
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Sodium Percarbonate (bleach)	1.71%
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White Vinegar	16.03%
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Silky Pink™ detergent	71.58%
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Water	balance
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The ingredients for II are mixed in a manner similar to Example I.

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III.

<u>Ingredients</u>	<u>Weight Percent</u>
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Sodium Percarbonate	4.94%
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White Vinegar	15.43%
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10 Silky Pink™	69.34%
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water	balance
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The ingredients for III are mixed in a manner similar to Examples I and II.

Results

Comparing examples I, II, and III, it was determined that Example II

15 provide the highest level of synergistic activity between the bleach and vinegar

while avoiding a toxic amount of chloramine gas to be released.